2018 AIAA SPACE and Astronautics Forum and Exposition, 2018

Analysis of the selenophysics parameters using the space missions data

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2018, American Institute of Aeronautics and Astronautics Inc, AIAA. All rights reserved. Many space agencies and countries have recently announced their plans on the exploration of the Moon in the next few years. The main purpose is to prepare and place long-term scientific and technical bases on the near side of the Moon and at the lunar Poles in order to conduct space experiments and study the lunar internal structure. For implementation of these plans the information on selenophysical parameters is essential, since without it solution of the tasks, ranging from the choice of place for the bases to their technical and scientific equipment, is impossible. In the present paper, the lunar gravitational field, dynamic figure, problem of the lunar core existence as well as free libration modes of the multi-layered Moon are analyzed using the space missions data.

http://dx.doi.org/10.2514/6.2018-5302

References

[1] Smith, D.E., “Geophysical Topography of the Moon from the Clementine lidar”, J. Geophys. Res. Res., V. 102, 1997, 1591.

[2] Binder, A.B., “Lunar Prospector: Overview”, Science, V. 281, Issue 5382, 1998, 1475-1476.

[3] Sood, R., Chappaz, L., Melosh, H.J., Howell, K.C., Milbury, C., Blair, D.M., Zuber, M.T., “Detection and characterization of buried lunar craters with GRAIL data”, Icarus, V. 289, 2017, 157-172.

[4] Araki, H., “Lunar Global Shape and Polar Topography Derived from Kaguya-LALT Laser Altimetry”, Science, 2009, V.323, 897-900.

[5] Burchell, M.J., Robin-Williams, R., Foing, B.H., “The SMART-1 lunar impact”, Icarus, 2010, V.207, Issue 1, 28-38.

[6] Nefedyev, Y., Valeev, S., Mikeev, R., Varaksina, N., Andreev, A. “Analysis of data of "CLEMENTINE" and "KAGUYA" missions and "ULCN" and "KSC-1162" catalogues”, Advances in Space Research, 50, 2012, 1564 – 1569.

[7] Williams, J.G., Boggs, D.H., Ratcliff, J.T., “Lunar fluid core moment”, Abstr. 41st Lunar and Planetary Science Conference, 2010, Abstract No 2336.

[8] Weber, R., Lin, P., Garnero, E.J., Williams, Q, Lognonne, P., “Seismic Detection of the Lunar Core”, Science, 2011, V. 331, 309-312.

[9] Garcia, R.F., Gagnepain-Beyneix, J., Ghevrot, S., Lognonne, P., “Very preliminary reference Moon model”, Physics of the Earth and Planetary Interiors, 2011, V. 188, 96-113.

[10] Barkin, Yu., Gusev, A., Petrova, N., “Study of spin-orbit and inner dynamics of the Moon: lunar mission applications”, Advances in Space Research, 2006, V. 37, 72-79.

[11] Getino, J., Farto, J.M., Ferrandiz, J.M., “Obtaining the free frequencies of the non-rigid Earth”, Cel. Mech. & Dyn. Astr., 1999, V. 71, 95-108. V. 71, 95-108.

[12] Petrova N., Gusev, A., “Modelling of the free lunar libration”, Abstr. Lunar and Planetary-Science Conference XXXVI, 2005, Abstract No 1448.

[13] Petrova, N., Gusev, A., “Free core nutation of the Moon”, Proc. Int. Conf. "Geom. of Phys. IV", Kazan, Kazan Univ. Press,

[14] Newhall, X.X., Williams, J.G., “Estimation of the lunar physical librations”, Cel. Mech. & Dyn. Astron, 1997, V. 66, 21-30.

[15] Moons, M., “Physical libration of the Moon”, Cel. Mech. & Dyn. Astron., 1982, V. 26, 131.

[16] Calame, O., “Free librations of the Moon from lunar laser ranging”, In: Scientific Applications of Lunar Laser Ranging, ed. J.D. Mulholland, Reidel, Dordrecht/Boston, 1977, 53-63.